UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/541,732	09/16/2005	Pamela Cosman	0321.68782	1790

24978 7590 08/03/2010

GREER, BURNS & CRAIN
300 S WACKER DR
25TH FLOOR
CHICAGO, IL 60606

EXAMINER	
ROBERTS, JESSICA M	

ART UNIT	PAPER NUMBER
2621	

MAIL DATE	DELIVERY MODE
08/03/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/541,732	COSMAN ET AL.	
	Examiner	Art Unit	
	JESSICA ROBERTS	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 March 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,11-15 and 18-20* is/are pending in the application.

4a) Of the above claim(s) *21-30* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,11-15 and 18-20* is/are rejected.

7)☒ Claim(s) *15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *7/7/05;4/23/07;7/22/09; 4/28/2010*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of the Claims

Claims 1-4, 7, 9-15, 18-20 are currently pending in Application No. 10.541,732. Applicant election **with** traverse of group1 on 03/04/2010 is acknowledged and claims 21-30 will be treated as non-elected. Claims 5-6. 10, 16-17, have been canceled by Applicants amendment.

Election/Restrictions

1. Applicant's election with traverse of group 1 in the reply filed on 03/04/2010 is acknowledged. The traversal is on the ground(s) that Groups II and III should be examined with group I. This is not found persuasive because Groups II and III are directed toward separate inventions. Group II is directed towards another embodiment concerns clients or peer users to compensate using their own bandwidth allocation, by starving some preceding or subsequent frames of their allocation of bits to create a high .the invention where applying a dual frame concept, use a single frame, the long term past frame with high quality, for motion compensation, until such time as it becomes obsolete (i.e., it is so different from the current frame that we are better off using the immediate past, poor quality frame for prediction) [0032).

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 19 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Regarding claim 19, it is unclear to the examiner as to what a composite frame is? For purposes of applying prior art, the examiner interprets a composite frame as a frame being predicted from both the short and long term frame memories.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1, 4, 7,11, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuhara et al.,"Very Low Bit-Rate Video Coding with Block Partitioning and Adaptive Selection of Two Time-Differential Frame Memories.

Regarding **claim 1**, Fukuhara teaches A video encoder (fig. 4 element video source encoder) comprising: a coder (fig. 4 element VLC) for encoding vectors (fig. 4 element motion vector) to describe at least an image block with respect to at least a reference block (motion compensation is performed between the current code frame and a reference frame, see I. Introduction, line 7-8); a short term reference block buffer storing at least one short term reference block (one is a reference stored in short-term frame memory (STFM), see I. Introduction, line 5-6; IV. Motion Estimation (ME) and Compensation (MC), and fig. 4 element STFM); and at least one long term reference block buffer storing at least one long term reference block (The other is a reference stored in long-term frame memory (LTFM), see I. Introduction, line 7-8; IV. Motion Estimation (ME) and Compensation (MC) and fig. 4 element LTFM); wherein the coder selectively chooses between encoding with respect to the at least one short term reference block in the short term reference block buffer and the at least one long term reference block in the long term reference buffer based upon one or more factors examined at the time of encoding to maximize one of compression, video quality, and a metric balancing compression and video quality (Fukuhara teaches where motion estimation is performed for every MB with half-pel accuracy. Its search area is ± 15.5 pixels (lines). In Step 1, three predicted macroblocks are produced. They are PMB(S), PMB(L) and PMB(IP). In Fig. 6, "t" frame is the most recently encoded frame. "t" frame is read from STFM while "L" frame is read from LTFM. PMB(S) is predicted from "t-1" frame (STFM) and PMB(L) is predicted from "L" frame (LTFM). On the other hand,

PMB(IP) is interpolation between PMB(S) and PMB(L). Frame data stored in LTFM is updated b every Nth frame. One of the three prediction modes is selected that gives the smallest prediction error. Fig. 8 shows the procedure of the MC method. In step 1, absolute error (AE) are calculated for all of the three prediction modes. They are AE_half(S), AE_half(L), and AE_inter. The minimum AE (AE_step1) is calculated for the decision of prediction mode with offset. Further, Fukuhara teaches In step 2, absolute errors are calculated for the 16 patterns (four BP's by four combinations). The prediction mode which gives the minimum AE (AE_Step2) among 16 AE's is selected in Step 2. In Step 3, the final prediction mode is selected by comparing AE_step 1 and AE_Step 2, see C. Procedure of MC and fig. 8. The examiner notes that selecting the prediction mode with the lowest absolute errors for encoding improves image quality, which read upon the claimed limitation). Fukuhara does not explicitly disclose a reference block.

However, it would have been obvious to one of ordinary skill in the art to incorporate a reference block, since a frame is composed of macroblocks.

Regarding **claim 4**, Fukuhara does not explicitly disclose the encoder of claim 1, wherein the coder for encoding selectively chooses the at least one long term reference block to encode background data and selectively chooses a more recent reference block to encode foreground data.

However, Fukuhara teaches where the proposed MC utilizes a couple of forward reference frames. One is a reference frame stored in a short-term frame memory (FM) which is overwritten frame by frame. It is basically for the motion estimation of the

moving objects. The other is a reference stored in long-term FM whose contents include the static objects or the moving object in the past. It is for the prediction of the background or the object occlusion, see IV. Motion Estimation (ME) and Compensation (MC). Note: the applicants' specification describes the background may be used for a substantial time period because of its static nature, while a foreground portion is motion compensated by a most recent or recently received frame. Since the applicant describes the background as having a static nature and the foreground as is motion compensated by a most recent or recently received frame, it is clear to the examiner that the short-term (FM) of Fukuhara is used for motion estimation of the objects, (foreground) and overwritten frame by frame and the long-term (FM) is used for static objects (background), which reads upon the claimed limitation.

Regarding **claim 7**, Fukuhara teaches the encoder of claim 1, wherein the one or more factors examined at the time of encoding include one or more of: the encoder's expectation of distortion at a decoder, a number of frame buffers in the encoder, the size of frame buffers in the encoder, any feedback from the decoder, a history of changing data channel quality, a history of the changing image region quality to selectively choose, for each at least one block being encoded, between the at least one long term reference block and the at least one short term reference block to maximize one of compression, video quality and a metric balancing compression and video quality (Fukuhara teaches where the final prediction mode is selected by comparing the absolute error of step 1 and the absolute error of step 2, see C. Procedure of MC, and fig. 8. The examiner notes that the prediction mode with the minimum error selected

yields better video quality of the image, which reads upon the claimed limitation. Further the examiner notes that claim 7 is a Markush group claim and the Fukuhara meets the limitation where the one faction includes video quality).

Regarding **claim 11**, Fukuhara teaches the encoder of claim 1, wherein the coder selectively chooses between coding using the at least one long term reference block (INTER coding) and using INTRA coding (fig. 8 element Intra/Inter Decision).

Regarding **claim 19**, Fukuhara teaches the encoder of claim I, wherein the at least one long term reference block comprises a composite frame (fig.6).

Regarding **claim 20**, Fukuhara teaches the encoder (fig. 4) of claim 1, wherein the at least one long term reference block comprises a long term reference frame (fig. 6) and the coder encodes a frame on a block by block basis (see B. Block Partitioning MC (BPMC) and fig. 4).

8. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuhara et al., "Very Low Bit-Rate Video Coding with Block Partitioning and Adaptive Selection of Two Time-Differential Frame Memories" in view of Applicants Admitted Prior Art (AAPA).

Regarding **claim 2**, Fukahara is silent in regards to the encoder of claim 1, wherein the coder for encoding selectively chooses the at least one long term reference block when a connection used by the video encoder changes to a lower quality.

However,Fukuhara discloses to select the encoding prediction that yields the lowest absolute error for the long and short term frame memories (see fig. 8), thus it is

clear to the examiner that Fukuhara discloses to select between long and short term memory based on error.

AAPA discloses when a connection used to transmit video data suffers a change in quality, the resulting video decoding may produce very poor results. When the reference frame provides poor quality reference, the decoding results declines rapidly. One technique to address this has been proposed is to retain multiple frames, [0008]. Thus, incorporating the teachings of AAPA with Fukuhara now discloses to select between the long and short term frame memory when the connection used to transmit data suffers, which reads upon the claimed limitation.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of AAPA with Fukuhara for providing improved image quality.

Regarding **claim 3**, see the rejection and analysis made for **claim 2**.

9. Claims 9, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuhara et al., "Very Low Bit-Rate Video Coding with Block Portioning and Adaptive Selection of Two Time-Differential Memories" in view of Gu e" al., US-7, 253, 831.

Regarding **claim 9**, Fukuhara teaches the encoder of claim 1, wherein the encoder comprises a long term reference block buffer (see fig. 4 element LTFM). Fukuhara is silent in regards to a plurality of reference block buffers.

However, Gu teaches an encoder (fig. 2) comprises a plurality of reference block buffers (see fig. 2 elements PM_0-PM_{m-1}).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Gu with Fukuhara for providing improved allocation of picture memory between short and long term memory.

Regarding **claim 14**, Fukuhara teaches the encoder of claim 1, wherein the at least one long term reference block buffer comprise a frame buffer (fig. 4), and the encoder coder selectively chooses between coding using the reference block (INTER coding) and using INTRA coding (see fig. 8 element Intra/Inter Decision).Fukuhara is silent in regards to multiple frame buffers.

However, Gu teaches an encoder (fig. 2) comprises a plurality of reference block buffers (Gu discloses where a see fig. 2 elements PM_0-PM_{m-1}).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Gu with Fukuhara for providing improved allocation of picture memory between short and long term memory.

Regarding **claim 18**, Fukuhara (modified by Gu) as a whole teaches everything as claimed above, see claim 14. In addition, Fukuhara teaches the encoder of claim 14, wherein the at least one long term reference block comprises a block in a region of interest (fig. 3, where it is disclosed four types of block partitioning. (STFM: short term frame memory/LTFM: long term frame memory). The examiner notes that the block is a region of interest, which reads upon the claimed limitation).

10. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuhara et al., "Very Low Bit-Rate Video Coding with Block Partitioning and Adaptive Selection of Two Time-Differential Memories" in view of Liu et al., US-5, 398,079.

Regarding **claim 12**, Fukuhara teaches The encoder of claim 11, wherein the coder conducts a fractional pixel accuracy encoding (see C. Procedure of MC, step 1, and fig. 8 element AE_half(S) and AE_half(L)), by, determining, for the at least one long term reference block and on a fractional pixel grid. Fukuhara is silent in regards to original pixel positions including pixels that coincide with an actual pixel position; horizontally or vertically interpolated pixel positions including pixels that lie between two original pixel positions; and diagonally interpolated pixel positions.

However, Liu teaches where original pixel positions including pixels that coincide with an actual pixel position; horizontally or vertically interpolated pixel positions including pixels that lie between two original pixel position, and diagonally interpolated pixel position (col. 4 line 33-43).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Liu with Fukuhara for providing efficient pixel interpolation.

11. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuhara et al., "Very Low Bit-Rate Video Coding with Block Partitioning and Adaptive Selection of Two Time-Differential Memories" in view of Liu et al., US-5, 398,079 and further in view of Zhang et al., "Video Coding with Optimal Inter/Intra-Mode Switching for Packet Loss Resilience"

Regarding **claim 13**, Fukuhara is silent in regards to the encoder of claim 12, wherein: first moments of the horizontally or vertically interpolated pixel positions and the diagonally interpolated pixel positions are calculated directly; and second moments of the horizontally or vertically interpolated pixel positions and the diagonally interpolated pixel positions are estimated.

However, Zhang teaches wherein: first moments of the horizontally or vertically interpolated pixel position and the diagonally interpolated pixel positions are calculated directly; and second moments of the horizontally or vertically interpolated pixel positions and the diagonally interpolated pixel positions are estimated (see III. Recursive Optimal Per-Pixel Estimate of Decoder Distortion).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Zhang with Fukuhara for improving image quality and encoding.

Allowable Subject Matter

12. Claim 15 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

13. The following is a statement of reasons for the indication of allowable subject matter: The present invention involves an encoder with the following novel features wherein the coder chooses between two types of INTER coding and the INTRA coding, the two types of INTER coding comprising coding using the at least one short term long term reference block (ST) and the at least one long term long term reference block (LT), and wherein; the coder computes moments for the INTRA coding and the ST block using a recursive optimal per pixel estimate treating elements of a previous block as a random variable; and the coder computes moments for the LT block using a recursive optimal per pixel estimate treating elements of a previous block as a random variable.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

15. Hoogenboom et al., US-5,638,128

16. Girod et al., US-6,560,284

17. Wiegand et al., US-6,807,231

18. Fukuhara et al., US-5,926,225

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JESSICA ROBERTS whose telephone number is (571)270-1821. The examiner can normally be reached on 7:30-5:00 EST Monday-Friday, Alt Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marsha D. Banks-Harold can be reached on (571) 272-7905. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Marsha D. Banks-Harold/
Supervisory Patent Examiner, Art Unit 2621

/Jessica Roberts/
Examiner, Art Unit 2621